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AMENDING THE ILLINOIS POSTCONVICTION STATUTE TO INCLUDE BALLISTICS TESTING

[T]he impress of the rifling upon the missile should be remembered. . . . The following method will give accurate results Verify the measurements by those obtained from several plugs compressed within the rifling. Compare these measurements with those found upon the missile, and if they agree, you may be sure that the bullet was fired from this weapon¹

INTRODUCTION

On July 23, 1997, Illinois Governor James Edgar signed into law a statute entitled Motion for Fingerprint or Forensic Testing Not Available at Trial Regarding Actual Innocence.² This statute (§ 5/116-3) permits postconviction motions for fingerprint or Deoxyribonucleic Acid (DNA) testing on evidence previously collected at trial. But this testing is only available if (1) misidentification is the issue in the case, (2) the new testing was not in existence at trial, and (3) the results of

1. A.L. Hall, *The Missile and the Weapon*, 35 BUFF. MED. J. 727, 735 (1900).

2. The statute states as follows:

(a) A defendant may make a motion before the trial court that entered the judgment of conviction in his or her case for the performance of fingerprint or forensic DNA testing, including comparison analysis of genetic marker groupings of the evidence collected by criminal justice agencies pursuant to the alleged offense, to those of the defendant, to those of the other forensic evidence, and to those maintained under subsection (f) of Section 5-4-3 of the Unified Code of Corrections, on evidence that was secured in relation to the trial which resulted in his or her conviction, but which was not subject to the testing which is now requested because the technology for the testing was not available at the time of trial. Reasonable notice of the motion shall be served upon the State.

(b) The defendant must present a prima facie case that:

(1) identity was the issue in the trial which resulted in his or her conviction; and

(2) the evidence to be tested has been subject to a chain of custody sufficient to establish that it has not been substituted, tampered with, replaced, or altered in any material aspect.

(c) The trial court shall allow the testing under reasonable conditions designed to protect the State's interests in the integrity of the evidence and the testing process upon a determination that:

(1) the result of the testing has the scientific potential to produce new, noncumulative evidence materially relevant to the defendant's assertion of actual innocence even though the results may not completely exonerate the defendant;

(2) the testing requested employs a scientific method generally accepted within the relevant scientific community.

725 ILL. COMP. STAT. 5/116-3 (2004).

this new testing may prove the defendant's innocence.³ Section 5/116-3 was intended to "provide an avenue for convicted defendants who maintained their innocence to test available . . . material capable of producing new and dramatic evidence materially relevant to the question of innocence."⁴ But this statute does not extend to ballistics testing, and that limits its ability to prevent miscarriages of justice.⁵

Ballistics testing does not appear in the text of the statute and, in *People v. Pursley*,⁶ an Illinois Appellate Court held that the statute did not apply to ballistics testing under the Integrated Ballistics Identification Systems (IBIS).⁷ In *Pursley*, the defendant had been convicted of first-degree murder in the early 1990s.⁸ The defendant filed a post-conviction motion under the statute, petitioning the court for ballistics testing that was not available to him at his initial trial.⁹ The circuit court denied his motion and the appellate court affirmed,¹⁰ relying on the Illinois legislature's omission of ballistics testing from the statute itself.¹¹ The appellate court inferred from this omission that the reliability of ballistics testing had not been established.¹²

This Comment demonstrates that ballistics testing *is* a reliable means of identification, just as sound as DNA or fingerprint testing. By preventing convicted defendants from petitioning for ballistics testing, the Illinois legislature is denying defendants and other citizens a chance to remedy a possible injustice. The scientific technology is available; the legislature should allow its use. Part II discusses the statute's requirements and the history of ballistics testing, as well as IBIS's operation, advantages, and expected future improvements.¹³ Part III reviews and compares fingerprint, DNA, and ballistics testing, and argues that ballistics testing meets the established standard for the admissibility of scientific evidence, despite its limitations.¹⁴ Part IV discusses how the permissive use of DNA testing under § 5/116-3 has

3. Gregory W. O'Reilly, *A Second Chance for Justice: Illinois' Post-trial Forensic Testing Law*, 81 JUDICATURE 114, 114, 116 (1997).

4. *People v. Urioste*, 736 N.E.2d 706, 710 (Ill. App. Ct. 2000). As of November 1997, twelve wrongfully convicted defendants in Illinois have been exonerated though DNA or fingerprint testing. O'Reilly, *supra* note 3, at 114. That is about 30% of all defendants who were exonerated through the same circumstances nationally. *Id.*

5. See *infra* notes 124–222 and accompanying text.

6. 792 N.E.2d 378 (Ill. App. Ct. 2003).

7. *Id.* at 382.

8. *Id.* at 379.

9. *Id.* at 380.

10. *Id.*

11. *Id.* at 382.

12. *Pursley*, 792 N.E.2d at 383.

13. See *infra* notes 18–123 and accompanying text.

14. See *infra* notes 124–222 and accompanying text.

improved the criminal justice system, and proposes an amendment to allow ballistics testing under the statute.¹⁵ Part V reiterates the purpose of the statute and the role of ballistics testing in fulfilling that purpose.¹⁶

II. BACKGROUND

To fully understand why ballistics testing should be included in § 5/116-3, one must first explore the statute's requirements. Then one can see how ballistics testing meets these requirements through a discussion of its history, the concept of rifling patterns and bullet and cartridge-casing striation markings, as well as an analysis of IBIS.

A. Requirements Under § 5/116-3

In order to prepare an adequate petition under the statute, the convicted defendant must satisfy three elements: (1) the newly discovered evidence or current technology was not available at the time of trial; (2) there is a *prima facie* case that identity was the main issue at trial; and (3) the testing is considered reliable and produces new, materially relevant evidence.¹⁷ A convicted defendant must also file this petition through a particular process.¹⁸

The statute allows the evidence secured at the time of trial to be tested if the specific DNA or fingerprint testing was not then available, or if newer technology now exists.¹⁹ This is not a particularly difficult requirement to fulfill, so long as the defendant verifies that the testing methods were not available at the time of trial, or that he or she exercised due diligence at the time of trial but was unable to discover them.²⁰

The statute also requires the defendant to offer a *prima facie* case that identity was the main issue at trial, and that the evidence was subject to an adequate chain of custody.²¹ Courts have effectively amended the statute, however, by eliminating the latter requirement.²² An Illinois Appellate Court in *People v. Travis* found that "[i]t asks too much to require [a] petitioning defendant in these cases to plead and prove proper chain of custody at the outset, for the evi-

15. See *infra* notes 223–239 and accompanying text.

16. See *infra* notes 240–242 and accompanying text.

17. See *infra* notes 19–31 and accompanying text.

18. See *infra* notes 32–40 and accompanying text.

19. See 725 ILL. COMP. STAT. 5/116-3(a) (2004).

20. *People v. Cunningham*, 642 N.E.2d 781, 786–87 (Ill. App. Ct. 1994).

21. See 725 ILL. COMP. STAT. 5/116-3(b).

22. *People v. Travis*, 771 N.E.2d 489, 493 (Ill. App. Ct. 2002).

dence at issue will undoubtedly have been within the safekeeping of the State, not the defendant.”²³ Therefore, the defendant must demonstrate only that identity was at issue during the trial.²⁴

Finally, the statute requires that new DNA or fingerprint testing be allowed if the testing may produce new, materially relevant evidence and if the new testing methods are “generally accepted within the relevant scientific community.”²⁵ In order to understand what evidence is “materially relevant,” one must break down the definition of these terms. “Relevant” evidence is defined as “[e]vidence tending to prove or disprove a matter in issue.”²⁶ “Materially” acts as a modifier to “relevant evidence” and means “having a certain or probable bearing on the proper determination of [the] case.”²⁷ Therefore, any materially relevant evidence to “a defendant’s claim of actual innocence is simply evidence which tends to significantly advance that claim.”²⁸ Courts should not interpret this statutory requirement to mean that the test result alone must “completely exonerate a defendant.”²⁹

The second half of this requirement allows any new DNA or fingerprint test to be authorized if it meets the standard for admissibility set forth in *Frye v. United States*.³⁰ Under the *Frye* analysis, the new DNA or fingerprint testing proposed under the statute “must be sufficiently established to have gained general acceptance in the particular field in which it belongs.”³¹

Section 5/116-3 contains no statute of limitations, so a convicted defendant may bring the motion at any time. But if convicted defendants decide to invoke the statute, there are formalities with which they must comply. First, the defendant must bring a post-trial motion in the court that “entered the conviction.”³² If this motion is granted, and the results from the DNA or fingerprint testing are favorable to the convicted defendant, then the defendant may petition for a new trial based on these results.³³ The court then decides whether the new

23. *Id.*

24. *See id.*

25. 725 ILL. COMP. STAT. 5/116-3.

26. *People v. Savory*, 756 N.E.2d 804, 810 (Ill. 2001) (alteration in original) (quoting BLACK’S LAW DICTIONARY 579 (7th ed. 1999)).

27. WEBSTER’S THIRD NEW INTERNATIONAL DICTIONARY 1392 (1993) (cited in *Savory*, 756 N.E.2d at 810).

28. *Savory*, 756 N.E.2d at 811.

29. *Id.*

30. 293 F. 1013 (D.C. Cir. 1923); O’Reilly, *supra* note 3, at 116.

31. *Frye*, 293 F. at 1014.

32. O’Reilly, *supra* note 3, at 116.

33. *Id.*

trial would probably result in a different outcome.³⁴ If the answer is yes, then the defendant is granted a new trial.³⁵ If the answer is no, then the defendant's motion is denied and a final judgment is entered.³⁶

Courts generally disfavor applications for new trials based solely upon newly discovered evidence,³⁷ so courts will closely scrutinize them.³⁸ Convicted defendants must rebut a presumption in favor of the conviction's validity and show that they were diligent in attempting to discover the testing method.³⁹ The court has significant discretion in making its ruling; its decision will not be reversed absent an abuse of discretion.⁴⁰

B. The Background of Ballistics Testing

While the Illinois statute *as written* does not include ballistics testing, one must understand the background of ballistics testing in order to realize why it should be included. Internal ballistics studies the markings or "striations" made to the bullet or cartridge casing when the firearm is discharged.⁴¹ This section discusses the history of ballistics testing, and the concept of ballistics identification through the examination of rifling patterns and striation markings. It also discusses IBIS's routine operation, its advantages, and its expected future improvements.⁴²

34. *People v. Waters*, 764 N.E.2d 1194, 1202 (Ill. App. Ct. 2002); O'Reilly, *supra* note 3, at 116.

35. See O'Reilly, *supra* note 3, at 116.

36. *People v. Savory*, 756 N.E.2d 804, 809 (Ill. 2001).

37. *People v. Cunningham*, 642 N.E.2d 781, 786–87 (Ill. App. Ct. 1994); *People v. Waldroud*, 516 N.E.2d 623, 625 (Ill. App. Ct. 1987); *People v. Johnson*, 504 N.E.2d 502, 507 (Ill. App. Ct. 1986).

38. *Cunningham*, 642 N.E.2d at 786–87; *Waldroud*, 516 N.E.2d at 625; *Johnson*, 504 N.E.2d at 507.

39. *Cunningham*, 642 N.E.2d at 786–87; *Waldroud*, 516 N.E.2d at 625; *Johnson*, 504 N.E.2d at 507.

40. *Cunningham*, 642 N.E.2d at 786–87; *Waldroud*, 516 N.E.2d at 625; *Johnson*, 504 N.E.2d at 507.

41. Gil Hocherman et al., *Firearms—A Review: 2001 to 2004*, in INTERPOL-LYON, 14TH INTERNATIONAL FORENSIC SCIENCE SYMPOSIUM 47, 51 (Niamh Nic Daéid ed., 2004), available at <http://www.interpol.org/Public/Forensic/IFSS/Default.asp>. There are two additional studies of ballistics: (1) external ballistics, which studies the bullet from when it leaves the barrel to when it hits its target, and (2) terminal ballistics, which studies the bullet's impact upon hitting the target. *Id.* Terminal ballistics is also referred to as "wound ballistics" when the victim was alive at the time of impact. *Id.*

42. See *infra* notes 43–123 and accompanying text.

1. History of Ballistics Testing

Ballistics testing is over one hundred years old.⁴³ Over the past century, improved technology has allowed the remarkable growth and development of ballistics databases. In the early 1990s, the Bureau of Alcohol, Tobacco, and Firearms (ATF) established IBIS, and the Federal Bureau of Investigation (FBI) established the DRUGFIRE system.⁴⁴ These database systems were both created to maintain and store the imaging of bullet and casing signatures.⁴⁵ State and local law enforcement agencies utilized these systems and were “able to compare bullets and casings found at different crime scenes, establish connections, and build cases against suspects.”⁴⁶

In June of 1996, the National Institute of Standards and Technology (NIST) submitted a report in an attempt to make IBIS and DRUGFIRE interoperable.⁴⁷ Shortly thereafter, the ATF and FBI formed an agreement to work together on the development of these ballistics databases.⁴⁸ This agreement created the National Integrated Ballistics Information Network (NIBIN).⁴⁹ NIBIN combined the best aspects of both IBIS and DRUGFIRE into one complete database

43. BRIAN J. HEARD, HANDBOOK OF FIREARMS AND BALLISTICS: EXAMINING AND INTERPRETING FORENSIC EVIDENCE 109–10 (1997). In 1907, the Frankfort Arsenal was able to positively identify thirty-nine out of the forty-five examined cartridge cases to either a Krag rifle or Springfield rifle used in a riot in Brownsville, Texas, through the use of only magnified photographs of firing pin impressions on the spent cartridge cases. *Id.* In 1932, the first ballistics database was published in Germany. *Id.* at 111; see also Otto Mezger et al., *Determination of the Type of Pistol Employed from an Examination of Fired Bullets and Shells* (pts. 1 & 2), 2 AM. J. POLICE SCI. 473 (1931), 3 AM. J. POLICE SCI. 124 (1932) (translation of Otto Mezger et al., *Die Bestimmung des Pistolensystemes aus Verfeuerten Hülzen und Geschossen*, 89 ARCHIV FÜR KRIMINOLOGIE 1, 1–32, 93–116 (1931)). This database contained 232 photographs of various self-loading pistols, each with enlarged pictures of the breech face and the striation markings on spent cartridge cases, as well as measurements of the number of lands and grooves, the width of lands and grooves, the direction of twist, and the angle of twist. HEARD, *supra*, at 111.

44. Li Ma et al., *NIST Bullet Signature Measurement System for RM (Reference Material) 8240 Standard Bullets*, 49 J. FORENSIC SCI. 649, 649 (2004); J. Song et al., *SRM 2460/2461 Standard Bullets and Casings Project*, 109 J. RES. NAT'L INST. STANDARDS & TECH. 533, 533–34 (2004) [hereinafter Song et al., *SRM 2460/2461*].

45. Song et al., *SRM 2460/2461*, *supra* note 44, at 534.

46. J.F. Song et al., *Standards for Bullets and Casings*, MATERIALS TODAY, Nov. 2002, at 26, 27 [hereinafter Song et al., *Standards*].

47. NAT'L INTEGRATED BALLISTIC INFO. NETWORK, DEPT. OF THE TREASURY, BUREAU OF ALCOHOL, TOBACCO & FIREARMS, THE MISSING LINK: BALLISTICS TECHNOLOGY THAT HELPS SOLVE CRIMES 7 (2001), available at <https://www.nibin.gov/missing> [hereinafter MISSING LINK]. Interoperability “exists if the systems are able to (1) capture an image according to a standard protocol and in conformity with a minimum quality standard and (2) exchange images electronically in such a manner that an image captured on one system can be analyzed and correlated on the other.” *Id.*

48. *Id.* at 8.

49. *Id.*

that would benefit all federal, state, and local law enforcement agencies.⁵⁰ The agreement also established the NIBIN Board to “assist State and local police with violent crime reduction efforts, to foster cooperation in the best interests of law enforcement, and to ensure a unified approach to developing future networking technologies in order to create a national ballistics system.”⁵¹

On December 2, 1999, the FBI and ATF signed a Memorandum of Understanding for joint agency implementation of NIBIN.⁵² In December 2002, IBIS workstations were installed in the last of the 233 U.S. crime laboratories scheduled to be on NIBIN.⁵³ Additionally, laboratories in twenty-eight other countries use workstations similar to IBIS.⁵⁴

2. *The Concept of Ballistics*

Dr. A.L. Hall was one of the first scientists to publish what is known as the “fundamental theory of ballistics.”⁵⁵ This theory holds that every firearm is unique; every bullet projected through a firearm, and every cartridge or casing ejected, has distinctive characteristics that are exclusive to that particular firearm.⁵⁶ This section discusses how

50. *Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations, FY2001: Hearing Before the S. Subcomm. on Commerce, Justice, State, and the Judiciary Appropriations, 106th Cong. 215, 225 (2000)* (Statement of Louis J. Freeh, Director, Federal Bureau of Investigation) [hereinafter Statement of Freeh].

51. MISSING LINK, *supra* note 47, at 8.

52. Statement of Freeh, *supra* note 50, at 225; MISSING LINK, *supra* note 47, at 8. According to this agreement, the FBI is accountable for NIBIN’s nationwide communications network and all “connectivity between system sites and the national network.” Statement of Freeh, *supra* note 50, at 225. The FBI’s main communications network for NIBIN is the nationwide Criminal Justice Information Services-Wide Area Network (CJIS-WAN). *Id.* The ATF is responsible for NIBIN’s “hardware and software development and installation, training, security, maintenance, user protocols and support, and quality control.” *Id.* Also, the ATF agreed to replace all existing DRUGFIRE systems with IBIS, subject to funding. *Id.*

53. Ma et al., *supra* note 44, at 649; Song et al., SRM 2460/2461, *supra* note 44, at 534.

54. Peter Weiss, *A Shot in the Light: Precise Bullet Replicas Take Aim at Crime-Fighting Standards*, 163 SCI. NEWS ONLINE, Jan. 11, 2003, <http://www.sciencenews.org/articles/20030111/bob9.asp>.

55. Hall, *supra* note 1; see also HEARD, *supra* note 43, at 109.

56. Hall, *supra* note 1, at 735; see also Anthony A. Braga & Glenn L. Pierce, *Linking Crime Guns: The Impact of Ballistics Imaging Technology on the Productivity of the Boston Police Department’s Ballistics Unit*, 49 J. FORENSIC SCI. 701, 701 (2004). Small-arm firearms include handguns (including single-shot pistols, derringers, revolvers, and auto-loading pistols), rifles, shotguns, submachine guns, and machine guns. VINCENT J.M. DI MAIO, *GUNSHOT WOUNDS: PRACTICAL ASPECTS OF FIREARMS, BALLISTICS, AND FORENSIC TECHNIQUES* 1–16 (2d ed. 1999). The ammunition of small-arm firearms consists of a cartridge case, primer, propellant, and a type of missile. HEARD, *supra* note 43, at 39. A cartridge case is the ammunition case and primer; it does not include the bullet. *Id.* The explosion of the priming compound causes a 2000 degree Celsius flame jet to ignite the propellant, which consists of “a chemical or mixture of chemicals” that burns into a large volume of gas. *Id.* at 39, 76. This gas causes the missile, which can either

the rifling pattern, which gives firearms their unique signature, is made and how bullets and cartridge casings obtain striation markings.⁵⁷

a. Rifling Pattern

“Rifling” is a pattern of “spiral grooves cut into the inside surface” of the barrel to implement a gyroscopic effect on the bullet so that its flight is stable and accurate.⁵⁸ The barrel of a firearm, originally a solid piece of steel, is carved out by a drill or an electric current to produce a twist of “grooves” and “lands.”⁵⁹ The lands are the remaining parts of the barrel not affected by the rifling cutter, while the grooves are the depressions the cutter causes.⁶⁰ The pattern made can either be squared, with distinct lands and grooves, or polygonal, with smooth and gradual lands and grooves.⁶¹ After a rifling pattern is implemented, the firearm is ground, hand-filed, and occasionally hand-polished.⁶²

The actual number of grooves is irrelevant to a ballistics examination; it is the microstria, or microscopic scratch marks, that are essential for comparison purposes.⁶³ The majority of microstria are

be a bullet, pellet, or shot, to be pushed through the barrel of the firearm and ultimately out of the firearm through the muzzle. *Id.* at 76.

57. See *infra* notes 58–76 and accompanying text.

58. HEARD, *supra* note 43, at 117.

59. RICHARD SAFERSTEIN, CRIMINALISTICS: AN INTRODUCTION TO FORENSIC SCIENCE 432–33 (8th ed. 2004); FirearmsID.com, Rifling, http://firearmsid.com/A_bulletIDrifling.htm (last visited Jan. 6, 2007) [hereinafter *Rifling*]. The following are some examples of rifling methods: (1) hook cutter rifling, when a hardened steel cutter is simultaneously rotated and dragged through the barrel; (2) scrape cutter rifling, when a bar with curved and hardened steel scrapers is simultaneously rotated and dragged through the barrel; (3) broach rifling, the most common type, when several steel disks placed in ascending width on a steel rod are simultaneously rotated and dragged through the barrel; (4) button rifling, when a long rod with a “button” on the end is simultaneously rotated and pushed or pulled through the barrel; (5) swage or hammer rifling, when a mandril (a steel plug with the rifling pattern etched on it) is inserted into the barrel and the barrel is then either hammered or hydraulically squeezed to obtain the negative of the rifling pattern; and (6) electrochemical rifling, which occurs when an electric current runs through the inside of the barrel. HEARD, *supra* note 43, at 120–22.

60. HEARD, *supra* note 43, at 117.

61. *Id.* at 123; see also *Rifling*, *supra* note 59. A typical barrel can have as few as one groove or as many as twenty-four. HEARD, *supra* note 43, at 117. Barrels may even have more than twenty-four grooves if they are microgrooved barrels. *Id.* Particular rifling class characteristics (i.e., number of lands and grooves, width of lands and grooves, diameter of lands and grooves, depth of grooves, direction of twist, and degree of twist) have been recorded in a database for thousands of different firearms to determine the particular make and model of the firearm, since each type has a particular set of traits. DI MAIO, *supra* note 56, at 39; HEARD, *supra* note 43, at 117–18.

62. HEARD, *supra* note 43, at 127.

63. *Id.* at 117.

randomly created through the manufacturing process.⁶⁴ Therefore, each random pattern of distribution, size, and shape of microstria give each firearm a unique marking.⁶⁵

b. Striation Markings

The microstria, which imprint unique striation marks on the ammunition, are found on firearm parts that are individually created.⁶⁶ The process for manufacturing those parts generally “involves cutting, drilling, grinding, hand-filing and, very occasionally, hand-polishing.”⁶⁷ Also adding to the unique signature of each firearm is the continuous buildup in barrels—inclusions of metal or corrosion pits—as well as damage caused by improper cleaning.⁶⁸ Consequently, the uniqueness of each firearm gradually evolves over time.⁶⁹

The barrels of most handguns, rifles, and shotguns have a unique rifling pattern. When the bullet, which has a larger diameter than the barrel, is pushed out of a firearm through an explosion, the bullet acquires particular striation marks unique to that firearm.⁷⁰ Some striations may be rubbed off or altered by a barrel’s imperfections, but others remain.⁷¹

The same gases that push the bullet out of the barrel simultaneously push the cartridge case back with the same force, causing the cartridge case to share the firearm’s distinctive striation markings.⁷² The cartridge and cartridge casing are ultimately ejected from the rear of the firearm after impact with the firing pin, breech face, and ejector.⁷³ The breech block contains random markings that give the firearm a unique signature.⁷⁴ The firing pin’s shape will also be molded into the cartridge case.⁷⁵ Any distinct impressions on the spent cartridge case

64. *Id.*

65. *Id.* “Individual characteristic” is the term used for those traits that can individualize the weapon. *Id.* at 124. If the bullet is made of lead, then the striation marks will be more prominent where the grooves strike the bullet. DI MAIO, *supra* note 56, at 39. On the other hand, if the bullet is jacketed, then the land markings are the most prominent. *Id.*

66. HEARD, *supra* note 43, at 117, 126.

67. *Id.* at 127.

68. *Id.* at 125.

69. *Id.*

70. SAFERSTEIN, *supra* note 59, at 432–33; *Rifling*, *supra* note 59. Typically the barrel of a shotgun is smooth, but some older shotguns have a paradox rifling, a short length of rifling at the tip of the barrel to fire a solid slug. HEARD, *supra* note 43, at 117, 128.

71. HEARD, *supra* note 43, at 128–31.

72. SAFERSTEIN, *supra* note 59, at 439.

73. Ma et al., *supra* note 44, at 649.

74. SAFERSTEIN, *supra* note 59, at 439.

75. *Id.* at 439–40.

will assist in matching it to a particular weapon, or at least narrow the range of possible weapons.⁷⁶

3. *The Integrated Ballistics Identification System (IBIS)*

Law enforcement agencies are able to correlate the unique signatures of bullets and cartridges from different crime scenes with particular firearms through the use of IBIS.⁷⁷ IBIS also assists in identifying crime and firearm trends over time.⁷⁸ The main advantage of IBIS is its ability to cope with the ever increasing number of crime scene exhibits, whereas the use of regular laboratories often leads to “delays, backlogs and prioritization.”⁷⁹ This section discusses how IBIS operates by examining the following routine phases: (1) data acquisition, (2) signature analysis, (3) standardized firing, and (4) firearms examiner.⁸⁰

a. IBIS Operation

The goal of ballistics testing is to arrive at a final classification to attempt to match individual bullet or casing characteristics.⁸¹ Bullets can, with the assistance of IBIS, be “connected, *beyond reasonable doubt*, to a particular weapon” through their striation marks.⁸² IBIS analyzes the signatures of the bullets or casings collected as evidence and compares them to stored computerized signatures.⁸³

76. *Id.* at 440.

77. Hocherman et al., *supra* note 41, at 52. IBIS, a two-dimensional ballistics database, is the leading ballistics database available. *Id.* BRASSTRAX® is thought to be “the next generation of two-dimensional” automated-comparison systems. *Id.* In BRASSTRAX®, the data input will be entirely automatic, in an attempt to eliminate any possibility of error while documenting the evidence and thereby increase the accuracy of the results. *Id.* There are also three-dimensional ballistics databases, which tend to be more stable and have less possibility of error, due to the documenting of the evidence by the operator in the automatic system and the data acquisition system. *Id.* Such systems, however, are relatively new and are infrequently used in ballistics laboratories; consequently, few studies have been performed on these systems. *Id.* An example of a three-dimensional system is BULLETTRAX®. Hocherman et al., *supra* note 41, at 52.

78. *Id.*

79. *Id.*

80. See *infra* notes 81–103 and accompanying text.

81. An individual or matching statement “serve[s] to link some data found at the crime scene to a particular defendant.” TERRENCE F. KIELY, *FORENSIC EVIDENCE: SCIENCE AND THE CRIMINAL LAW* 28 (2001).

82. HEARD, *supra* note 43, at 125.

83. Song et al., *SRM 2460/2461*, *supra* note 44, at 534.

i. Data acquisition station

First, evidence is submitted to IBIS through the use of an optical microscope and a camera.⁸⁴ A firearms examiner or a technician will likely be the person examining the evidence and submitting it to IBIS.⁸⁵ In particular, the bullet's lands and the cartridge casing's breech face, firing pin and ejector (if present) are all documented in IBIS.⁸⁶ When documenting these marks, it is important to use a sufficient amount of light, so that there are no shadows in the marks that could upset the correlation results.⁸⁷ Images of firing pins, in particular, are extremely sensitive to lighting variations.⁸⁸ In addition to the documented images, each record contains demographic information (e.g., crime date or location).⁸⁹ On average, it takes approximately five minutes to fully document a cartridge casing and approximately twelve minutes to fully document a bullet.⁹⁰

ii. Signature analysis station

Once the image is captured on IBIS, the data is sent to the regional server for storage and comparison against other images in the database.⁹¹ This begins the second phase of IBIS. A correlation algorithm produces results based on the degree of similarity between the evidence and items within the database.⁹² The regional server then produces a listing of high confidence candidates and submits those candidates back to the original requester.⁹³ When performing bullet-image signature comparisons, IBIS scores may be based upon a single pair of land images or between two different sets of land images, each containing multiple lands.⁹⁴

84. *Id.*

85. MISSING LINK, *supra* note 47, at 11; U. Argaman et al., *Utilization of the IBIS in Israel*, 33 AFTE J. 269, 269 (2001). The same standards for ballistics testing must be implemented to all ballistics laboratories nationwide in order to maintain a large, reliable ballistics database. Ma et al., *supra* note 44, at 649.

86. MISSING LINK, *supra* note 47, at 11.

87. Zeno J. Geradts et al., *Image Matching Algorithms for Breech Face Marks and Firing Pins in a Database of Spent Cartridge Cases of Firearms*, 119 FORENSIC SCI. INT'L 97 (2001).

88. *Id.*

89. MISSING LINK, *supra* note 47, at 11.

90. *Id.*

91. *Id.*

92. Song et al., *SRM 2460/2461*, *supra* note 44, at 534.

93. *Id.*; see also MISSING LINK, *supra* note 47, at 11.

94. Song et al., *SRM 2460/2461*, *supra* note 44, at 534.

iii. Standardized firing station

If a suspect's firearm is available, examiners at both the ATF and the FBI fire and collect sample bullets using a standardized firing procedure.⁹⁵ These control sample bullets, termed Quality Assurance (QA) bullets, "are intended for measurement of quality control of IBIS systems."⁹⁶ Before QA bullets are gathered, examiners wipe "excess grease, oil or debris" from the barrel and breech face so that any accidental stria do not alter the control samples.⁹⁷ Once the suspect's firearm is carefully cleaned, a minimum of four rounds of identical ammunition are fired into a water trap to preserve fine striation markings.⁹⁸

In an attempt to identify bullets and cartridge cases accurately, it is standard practice to use the same brand of ammunition that is usually fired from the suspect's firearm.⁹⁹ If possible, the firearms examiner should actually use ammunition taken from the suspect's firearm or from the same ammunition box.¹⁰⁰

iv. Firearms examiner station

Like the Automated Fingerprint Identification System (AFIS), where the ten closest matches are the end result of the analysis,¹⁰¹ IBIS does not positively match bullets or casings to the weapon in evidence.¹⁰² Rather, IBIS produces a short list of highly matched candidates; a firearms examiner then compares the candidates to the evidence using a microscope.¹⁰³

b. Advantages of IBIS

IBIS is only as effective as the quality and quantity of the images contained within it.¹⁰⁴ Today, more than 800,000 images have been

95. *Id.*

96. *Id.*

97. HEARD, *supra* note 43, at 133.

98. *Id.*; see also DI MAIO, *supra* note 56, at 40. Traditionally, bullets were fired into a cotton waste; however, this material caused a "wipe-off" of some of the finer striation marks in soft lead bullets. *Id.* at 31. Consequently, ballistics laboratories now use the standard water trap method in gathering bullet control samples in order to better preserve the finer striation marks. *Id.*

99. *Id.* at 33.

100. *Id.* at 32.

101. KIELY, *supra* note 81, at 224 ("It is important to understand that the AFIS system does not itself provide match identification that serves as the basis for a fingerprint expert's identification testimony.").

102. MISSING LINK, *supra* note 47, at 11.

103. *Id.*; SAFERSTEIN, *supra* note 59, at 443.

104. J. De Kinder, *Ballistic Fingerprinting Databases*, 42 SCI. & JUST. 197, 198-99 (2002). Standardization of the documenting and analyzing methods plays an important role in improving

digitalized into IBIS, and more than 8000 matches in over 16,000 cases have been identified through the use of IBIS.¹⁰⁵ IBIS continues to grow as ballistics laboratories throughout the United States record more information into the system.

IBIS may be expensive to implement, but the high costs of implementation are offset by the low long-term costs of operation.¹⁰⁶ A Boston study concluded that IBIS was cost-effective and that all investments would ultimately pay off.¹⁰⁷ Additionally, the costs of IBIS equipment will undoubtedly decrease with time.¹⁰⁸ The reason for this is twofold. First, the odds of obtaining a match will continue to increase as more evidence is entered into the database.¹⁰⁹ Second, history and basic economics indicate that the longer technology is available, the cheaper the price will be.¹¹⁰

c. Fine-Tuning of IBIS

In an attempt to fully calibrate IBIS equipment and image-recording protocols, scientists are currently working on ways to fine-tune IBIS through the development of a uniform standard.¹¹¹ Robert Thompson, an ATF firearm examiner, was the first to become concerned with the irregularities in QA bullets.¹¹² Thompson hoped to obtain a high degree of reproducible and recognizable patterns on bullets and casings so that IBIS could maintain consistent records and ranks.¹¹³

In response to Thompson's efforts, the Office of Law Enforcement Standards provided funding for NIST to develop Standard Reference

the output of databases. Hocherman et al., *supra* note 41, at 52. Studies have shown that a "skilled operator can improve system performance through proper data acquisition and their correct analysis." *Id.*

105. SAFERSTEIN, *supra* note 59, at 441.

106. Braga & Pierce, *supra* note 56, at 705.

107. *Id.* The Boston Police Department (BPD) spent \$208.33 for a firearms examiner to compare and analyze only two cartridge casings. *Id.* This may appear as the more cost effective procedure since the initial IBIS equipment cost the BPD \$295,000. *Id.* But by looking at the study from only this superficial perspective, one cannot see the entire picture. As of December 2003, the BPD had over 12,700 cartridge casings within their inventory. *Id.* To manually compare just one cartridge casing to every other casing in their inventory would cost the BPD more than \$2.6 million. *Id.* When faced with such an astonishing figure, the expense of \$295,000, or approximately \$744.95 per match, is easily justifiable. Braga & Pierce, *supra* note 56, at 705.

108. *Id.*

109. *Id.*

110. *Id.*

111. Weiss, *supra* note 54.

112. Song et al., *SRM 2460/2461*, *supra* note 44, at 534. Thompson "outlin[ed] the concept of mass-producing quality assurance standards for bullets and casings" in a December 1995 correspondence to the Director of the Office of Law Enforcement Standards at NIST. *Id.*

113. *Id.*

Material (SRM) 2460/2461 standardized bullets and casings.¹¹⁴ Ultimately, NIST created twenty SRM bullets in January 2002, and another twenty SRM bullets in June 2003.¹¹⁵ With only forty SRM bullets, 240 bullet profile signatures were produced.¹¹⁶ Subsequent tests were performed by comparing the SRM bullet profile signatures to the virtual bullet signatures.¹¹⁷ The analysis yielded results proving a high uniformity and reproducibility rate.¹¹⁸

Additionally, NIST created a computer program that produces a number indicating how well the profiles match, based on a mathematical comparison of the bullets' surface profiles.¹¹⁹ Such an algorithm will eliminate the need for firearm experts to make the final determination regarding identification.¹²⁰ This new method of comparison is similar to the method used to compare DNA samples.¹²¹ The implementation of NIST's public-domain algorithm would "provide firearms examiners with an unprecedented opportunity to harden their testimonies," because courts tend to prefer objective data.¹²² This

114. *Id.* NIST was given six bullet samples from the ATF and FBI, and from those samples NIST "measured profiles of the bullets' surface ridges and grooves to accuracies of 20 nanometers in depth and a few micrometers across the surface" and digitized six bullet signatures. *Id.* at 535 (quoting Weiss, *supra* note 54). These signatures, which are stored in a NIST computer, are considered the virtual standard used to construct and control measurements of the SRM bullets. *Id.* From these standards, NIST used a numerically controlled diamond turning machine, the same machine invented during the Cold War to sharpen extremely precise nuclear-warhead parts, to pattern the physical standard onto pieces of copper alloy, which were molded into bullets. Song et al., *SRM 2460/2461*, *supra* note 44, at 535; Weiss, *supra* note 54.

115. Song et al., *SRM 2460/2461*, *supra* note 44, at 535. The process of creating SRM bullets is extremely arduous. Weiss, *supra* note 54. Each land impression is created by nineteen rounds of cutting; each round of cutting eliminates no more than ten micrometers of copper. *Id.* The first set of twenty SRM bullets took an entire month to create. *Id.*

116. Song et al., *SRM 2460/2461*, *supra* note 44, at 541.

117. *Id.* at 536.

118. *Id.* The results were not perfect and also yielded some small differences. *Id.* at 539. One solution may be to measure the SRM bullets on the IBIS system and compare those measured images with the standard signatures in order to assure IBIS's measurement quality control:

NIST developed a difference function for bullet signature comparisons to quantify bullet signature differences. Compared with existing commercial algorithms for bullet signature comparisons, the proposed algorithm has several advantages: The use of all two- or three-dimensional data points of the signature in the comparison could yield a high degree of sensitivity and ensure a high degree of repeatability and reproducibility; [i]t can be used for quantifying signature differences for both two-dimensional bullet signatures and three-dimensional casing signatures; [and] [w]hen the same two- or three-dimensional signatures are compared with each other, their signature difference, calculated by the NIST algorithm, is zero.

Song et al., *Standards*, *supra* note 46, at 29.

119. Weiss, *supra* note 54.

120. *Id.*

121. *Id.*

122. *Id.* (quoting NIST forensic scientist Susan M. Ballou).

concept of quality control is still relatively new in the forensic field; but the SRM bullets demonstrate significant potential to aid nationwide crime fighting and fortify homeland security by verifying instrument calibration, ensuring measurement quality control, and endorsing IBIS.¹²³

III. ANALYSIS

The legal affirmation of ballistics testing's reliability is long overdue, and the Illinois Legislature must amend § 5/116-3 to include it. Although no state postconviction statute explicitly includes ballistics testing, the broad language in some of these statutes arguably encompasses this testing. This Part discusses IBIS's reliability and the current legislative stance on DNA, fingerprint, and ballistics testing throughout the nation.¹²⁴ Additionally, it compares DNA, fingerprint, and ballistics testing, analyzes ballistics testing under the *Frye* standard, and assuages any fears about including ballistics testing in § 5/116-3.¹²⁵

A. Proof of IBIS Reliability

The Illinois Legislature must amend § 5/116-3 to include ballistics testing based on IBIS, because it is a reliable scientific identification system comparable to those used in DNA and fingerprint testing. IBIS is used by laboratory technicians throughout the nation to aid investigators in solving cases every day, and studies have proven IBIS's reliability.

The Boston Police Department (BPD) became one of the first police departments in a major U.S. city to research whether the ability of its Ballistics Unit to link firearm crimes improved with the use of IBIS.¹²⁶ They found that it did.¹²⁷ In 1998 alone, "IBIS was associ-

123. Song et al., *Standards*, *supra* note 46, at 31.

124. See *infra* notes 126–158 and accompanying text.

125. See *infra* notes 159–222 and accompanying text.

126. Braga & Pierce, *supra* note 56, at 702. IBIS was a significant advancement from prior methods:

According to Sergeant James O'Shea, head of the Ballistics Unit and a firearms examiner, firearms examiners in the Ballistics Unit did not systematically compare bullets and casings from one scene with ballistics evidence recovered at other crime scenes to determine whether separate gun crimes were linked. When [the Boston Police Department's] firearms examiners did attempt to make such matches, known as making "cold hits," it happened in one of two ways: (i) the firearms examiner may have recognized some unique markings on a cartridge casing . . . recovered at another crime scene; [or] (ii) a detective would develop an investigative lead from a confidential informant that a recovered crime gun had been used previously in another gun crime and would request the firearms examiner to make comparisons of evidence across the crime scenes.

ated with 523% more cold hits per month.”¹²⁸ The Boston study clearly indicates IBIS’s reliability and potential. In December 2003, the BPD had 396 confirmed IBIS identifications recorded.¹²⁹ To date, the BPD continues to use IBIS due to its great success in aiding in the crime reduction rate.¹³⁰

Even though IBIS was initially expensive, the cost of IBIS has decreased by nearly half since it was implemented.¹³¹ When calculating the cost of each IBIS match based upon IBIS’s total expenses, the results for 2003 yield a cost of only \$744.95 per match.¹³² Because IBIS’s reliability has been proven, and because IBIS is more efficient and cost-effective than the more archaic option of inspecting existing inventories for matches, the BPD’s efforts are not in vain. Aside from reliability and cost benefits, the system is necessary because laboratories will generally not have adequate human resources or funding to manually compare each sample.¹³³

IBIS has also been successful in fighting crime in New Orleans.¹³⁴ IBIS was used to help solve a long-term investigation of violent and brutal homicides within the city.¹³⁵ IBIS identified a definitive link between the firearms used by the “Hardheads” gang and evidence found at the crime scenes of numerous drug-related homicides.¹³⁶ Because of IBIS’s ability to find a correlation between the homicides, thirteen members of the gang were federally indicted and charged

Id. Forensic Technology, Inc. supported this independent assessment of IBIS “on the condition that [it] would not influence the conduct of the research or the presentation of the findings.” *Id.* at 701 n.*. Prior to March 1995, the BPD had firearms examiners attempt to match bullets and cartridge cases from each crime scene to a suspect’s firearm in only extreme situations or when two criminal events were suspiciously related to one another. *Id.* at 702.

127. *Id.* at 704. The annual number of firearm homicides, firearm aggravated assaults, and firearm robberies in Boston decreased by 58.8% (from 2788 to 1157) between 1990 and 2002. *Id.*

128. Braga & Pierce, *supra* note 56, at 705.

129. *Id.*

130. *Id.*

131. *Id.* In 1995, when IBIS was still in its beginning stages, the BPD paid \$540,000 for its use of IBIS equipment. *Id.* In December 2003, the BPD paid only \$295,000 for the same IBIS equipment purchased eight years earlier. *Id.*

132. Braga & Pierce, *supra* note 56, at 705.

133. *Id.*

134. MISSING LINK, *supra* note 47, at 24. New Orleans received its first IBIS equipment in 1996 in an attempt to reduce its homicide rate, which was one of the highest in the nation at that time. *Id.* IBIS proved successful within its first month, matching a bullet used to murder an innocent 12-year-old child in a drive-by shooting to a firearm recovered from a suspect’s residence. *Id.* With the assistance of IBIS, the suspect’s second firearm, recovered from his residence, was linked to an unrelated drive-by shooting, where multiple victims were injured. *Id.* Based upon this evidence and other investigative work, the suspect was convicted and received a life sentence. *Id.*

135. *Id.*

136. MISSING LINK, *supra* note 47, at 24.

with conspiracy to distribute cocaine.¹³⁷ Some of those defendants were also charged with knowingly using and carrying a firearm during and in relation to a drug trafficking crime, and of intentional possession of a firearm by a convicted felon.¹³⁸ Out of the eight defendants that eventually stood trial, seven were found guilty,¹³⁹ and eleven of those indicted were convicted.¹⁴⁰

IBIS's success was also demonstrated in Houston, Texas, where it was responsible for linking three armed robbery murders and an aggravated robbery in 2000.¹⁴¹ Once two suspects were located, IBIS and a separate firearms examiner were able to match the casings from one of the suspect's pistols to the evidence obtained from the crime scenes.¹⁴² In Goldsboro, North Carolina, IBIS assisted in linking the cartridge casings from two armed robberies with a firearm recovered in an automobile search in January 2001.¹⁴³ Subsequent testing of the confiscated firearm resulted in spent casings, which were scanned into NIBIN.¹⁴⁴ NIBIN yielded a high correlation rate between the newly entered casings and the three prior armed robberies.¹⁴⁵ The laboratory confirmed the match, and an investigation led to the arrest and conviction of the original suspects, who were last in possession of the recovered firearm.¹⁴⁶

IBIS has also been used to help link interstate crimes.¹⁴⁷ IBIS allows ballistics laboratories to make comparisons across large geo-

137. *United States v. Jones*, No. CRIM 98-207, 1999 WL 544695, at *1 (E.D. La. July 27, 1999).

138. *Id.*

139. *Id.*; see also *United States v. Baptiste*, 264 F.3d 578, 581 (5th Cir. 2001).

140. MISSING LINK, *supra* note 47, at 24–25.

141. *Id.* at 21; see also SAFERSTEIN, *supra* note 59, at 441–42. On June 2, 2000, two store clerks in Houston were shot and killed during a robbery. *Id.* Two bullets and two .40 caliber Smith and Wesson cartridge casings were found at the scene and were scanned into IBIS. *Id.* Later that same day, a security guard was shot and killed during an armed robbery, and a single bullet and a .40 caliber Smith and Wesson cartridge casing were found at the crime scene. *Id.* IBIS correlated a match between the three murders and a separate aggravated robbery which occurred two weeks earlier. *Id.* After further investigation, an aggravated robbery that occurred on February 11, 2000, was also linked to the newly collected evidence when a wallet was stolen and a credit card used. MISSING LINK, *supra* note 47, at 21.

142. MISSING LINK, *supra* note 47, at 22; see also SAFERSTEIN, *supra* note 59, at 442.

143. MISSING LINK, *supra* note 47, at 22.

144. *Id.* at 22–23.

145. *Id.* at 23.

146. *Id.*

147. On December 19, 1999, a person was murdered in Fayetteville, North Carolina. *Id.* Investigation led to an arrest warrant for a suspect who was believed to have fled to his home area of New York City. *Id.* On January 12, 2000, the same suspect was arrested in New York City for possession of narcotics and a 9mm semiautomatic pistol was recovered from the suspect; consequently, he was extradited to North Carolina to await his murder trial. MISSING LINK, *supra* note 48, at 25. The New York investigators test-fired the recovered pistol, using the same type of

graphical areas without the risk of compromising the chain of custody.¹⁴⁸ Additionally, IBIS may detect a nonmatch and therefore prevent any unnecessary transportation of evidence.¹⁴⁹

Not only can IBIS help fight crime within the United States, it can also help fight crime worldwide. With the help of IBIS, investigators in Rockville, Maryland were able to process and scan profiles for 1466 cartridge casings into IBIS, ultimately determining that eighteen different firearms were used at a particular mass burial site in Bosnia.¹⁵⁰ This information was presented at trial to assist jurors in convicting an individual for war crimes.¹⁵¹

B. The Current Legislative Stance on DNA, Fingerprint, and Ballistics Testing Throughout the Nation

Currently, the overwhelming majority of state statutes allow post-conviction motions solely for DNA testing.¹⁵² Only seven states have statutes that allow postconviction motions for DNA, fingerprint, or other forensic testing.¹⁵³ Thirteen states do not specifically allow post-conviction motions for DNA, fingerprint, or any other type of forensic testing; however, several of these statutes do allow postconviction motions if evidence of newly discovered material facts exists.¹⁵⁴

Even though ballistics testing is not explicitly mentioned in any state statute, some statutes may provide for such testing under their broad language. For example, an Arkansas statute allows postconviction motions for DNA tests, fingerprint tests, "or other tests which may become available through advances in technology."¹⁵⁵ Clearly, ballistics testing has "become available through advances in technology" and might be allowed under these statutes. Maryland allows postconviction motions for newly discovered evidence, including "DNA identification testing or other generally accepted scientific

ammunition used in the North Carolina murder, and scanned the spent bullet and cartridge casing into IBIS, which yielded a "very high correlation." *Id.* This correlation was confirmed by North Carolina's IBIS and a firearms examiner. *Id.*

148. *Id.*

149. *Id.*

150. SAFERSTEIN, *supra* note 59, at 442-43.

151. *Id.* at 443.

152. See, e.g., WIS. STAT. ANN. § 974.07 (West Supp. 2006).

153. See ARK. CODE ANN. § 16-112-202 (2006); IDAHO CODE ANN. § 19-4902 (2004); 725 ILL. COMP. STAT. 5/116-3 (2004); MD. R. 4-331; MINN. STAT. § 590.01 (2000), *amended by* 2005 Minn. Sess. Law Serv. 136 (West); VA. CODE ANN. § 19.2-327.1 (2004 & Supp. 2006).

154. See ALA. R. 32.1(e); ALASKA STAT. § 12.72.010 (2006); MASS. R. 30; MISS. CODE ANN. § 99-39-5 (2006); OKLA. STAT. tit. 22, § 1080 (2001); S.C. CODE ANN. § 17-27-20 (2005).

155. ARK. CODE ANN. § 16-112-202.

techniques.”¹⁵⁶ As demonstrated earlier, ballistics testing meets the *Frye* standard and is a generally accepted scientific technique.¹⁵⁷ Lastly, the Minnesota postconviction statute was recently amended to allow not only DNA and fingerprint testing but also “newly discovered evidence, including scientific evidence.”¹⁵⁸ Ballistics testing is an established science; therefore, any untested ballistic evidence would arguably be included under this statute as scientific evidence.

C. A Comparison of Ballistics, DNA, and Fingerprint Testing

Postconviction statutes nationwide often distinguish between DNA, fingerprint, and ballistics testing. There is no valid reason to do so since all three testing methods are reliable and used as investigative tools to help solve cases. By comparing ballistics, DNA and fingerprint testing, this section argues that the Illinois legislature should not continue to distinguish between these three types of testing methods.¹⁵⁹ Additionally, this section demonstrates that ballistics, DNA, and fingerprint testing are all still reliable under the *Frye* standard, despite minor drawbacks.¹⁶⁰

1. Ballistics Testing Under IBIS

As mentioned earlier, § 5/116-3 authorizes DNA and fingerprint testing only if the test requested in the postconviction motion “meets the *Frye* standard for evidence based upon methodologies generally accepted in the relevant scientific community.”¹⁶¹ What the legislature seems to forget—or chooses to ignore—is that ballistics testing meets the *Frye* standard¹⁶² and is, by the legislature’s own definition, a reliable forensic testing method.

The modern tendency of courts, including Illinois courts, is to allow expert testimony to demonstrate that the bullet or cartridge in evidence was fired from a specific gun, if the expert is qualified to give an opinion.¹⁶³ Experts must testify in detail as to the exact testing meth-

156. MD. R. 4-331(c)(3).

157. See *supra* notes 55–76 and accompanying text; see also *infra* notes 161–164 and accompanying text. Courts of other states have already held that ballistics testing satisfies the *Frye* standard. See, e.g., *Commonwealth v. Whitacre*, 878 A.2d 96 (Pa. 2005).

158. MINN. STAT. § 590.01 (2000), amended by 2005 Minn. Sess. Law Serv. 136 (West).

159. See *infra* notes 161–186 and accompanying text.

160. See *infra* notes 187–222 and accompanying text.

161. KIELY, *supra* note 81, at 274.

162. See, e.g., *Whiteacre*, 878 A.2d 96.

163. E. LeFevre, Annotation, *Expert Evidence to Identify Gun from Which Bullet or Cartridge Was Fired*, 26 A.L.R.2d 892 (2005); see also *People v. Fisher*, 172 N.E. 743, 754 (Ill. 1930).

ods used in order to adequately support their opinion.¹⁶⁴ Once a ballistics expert has testified regarding the identification of the firearm to a bullet contained in evidence, it is up to the trier of fact to determine the weight given to the expert's testimony.¹⁶⁵

2. *DNA Testing Under CODIS Versus Ballistics Testing Under IBIS*

CODIS (Combined DNA Index System), which is similar to IBIS, is an FBI-created computer software program that contains unique DNA profiles from convicted offenders, unsolved crime scene evidence, and profiles of missing persons on local, state, and national databases.¹⁶⁶ Thousands of matches have been made through CODIS's electronic comparison of DNA profiles.¹⁶⁷ Once a match in CODIS is found, "analysts calculate the frequency or rarity of seeing a particular DNA pattern to the frequency of seeing this combination in the general population."¹⁶⁸ Like CODIS, IBIS compares the scanned bullet or cartridge casing to others within its system to yield possible matches.¹⁶⁹ Even though IBIS does not yet have a frequency or rarity rate, that is the goal of researchers at NIST, who are attempting to numerically measure the degree of similarity between bullet samples through implementation of a public-domain algorithm.¹⁷⁰

164. *Fisher*, 172 N.E. at 754.

165. *People v. Berkman*, 139 N.E. 91, 95 (Ill. 1923) ("If any facts pertaining to the gun and its rifling existed by which such fact could be known, it would have been proper for the witness to have stated such facts and let the jury draw their own conclusions.").

166. SAFERSTEIN, *supra* note 59, at 389. The research and judicial implication of DNA testing has had a relatively short lifespan. In 1988, the first appellate court decision validated the use of DNA matching testimony. KIELY, *supra* note 81, at 270; *see also* *Andrews v. State*, 533 So. 2d 841, 851 (Fla. Dist. Ct. App. 1988) ("Given the evidence in this case that the test was administered in conformity with accepted scientific procedures so as to ensure to the greatest degree possible a reliable result, appellant has failed to show error on this point."). Currently, the accepted DNA-testing-method standards are restriction fragment length polymorphisms (RFLP), polymerase chain reaction (PCR), and short tandem repeat (STR). SAFERSTEIN, *supra* note 59, at 369-82. Additionally, courts are moving toward general acceptance of the newest method, mitochondrial DNA. KIELY, *supra* note 81, at 270. Mitochondrial DNA, which is located outside the cell nucleus in the mitochondrion, can only be maternally inherited. SAFERSTEIN, *supra* note 59, at 382.

167. SAFERSTEIN, *supra* note 59, at 389.

168. *People v. Almighty Four Hundred*, 677 N.E.2d 1332, 1336 (Ill. App. Ct. 1997) (referring to the expert testimony of Therese Finn).

169. *See supra* notes 84-103 and accompanying text.

170. Weiss, *supra* note 54.

3. *Fingerprint Testing Under AFIS Versus Ballistics Testing Under IBIS*

Fingerprint identification originated in ancient Egypt,¹⁷¹ but it was not until 1911 that the Illinois Supreme Court became the first court in the nation to recognize the scientific and legal practicability of fingerprint evidence.¹⁷² Nearly sixty years later, computers began to be used to classify and retrieve fingerprints.¹⁷³ Even though law enforcement was slow to adopt this technology, many state and local agencies now use AFIS to rapidly match fingerprints.¹⁷⁴ AFIS, which compares the fingerprints of a particular defendant to those of everyone arrested in a certain area, became available in Chicago in 1986.¹⁷⁵ Today, AFIS contains over 250 million sets of both criminal and civil fingerprints.¹⁷⁶

AFIS, which is similar to IBIS, “uses automatic scanning devices that convert the image of a fingerprint into digital minutiae that contain data showing ridges at their points of termination (ridge endings) and the branching of ridges into two ridges (bifurcations).”¹⁷⁷ The computer then uses an algorithm to determine the degree of correlation between the search and file prints.¹⁷⁸ Once the correlations are made, AFIS detects the ten closest matches.¹⁷⁹ Then a fingerprint expert examines the ten images submitted by AFIS and makes the final verification as to whether there is a match.¹⁸⁰

IBIS, like AFIS, is not perfect. Since both testing methods rely on human judgment to make the final determination, there is typically a substantial error rate.¹⁸¹ In AFIS’s first year of operation in San Francisco, the hit rate was only 18%.¹⁸² Although the hit rate was 10% higher than the prior year, when manual searches were used, it was still considerably low.¹⁸³

171. KIELY, *supra* note 81, at 221 (“[T]he impression of the monarch’s thumb was used as his sign manual . . .”).

172. *People v. Jennings*, 96 N.E. 1077, 1081–82 (Ill. 1911).

173. SAFERSTEIN, *supra* note 59, at 415.

174. *Id.*

175. O’Reilly, *supra* note 3, at 115.

176. KIELY, *supra* note 81, at 219.

177. SAFERSTEIN, *supra* note 59, at 415 (emphasis omitted).

178. *Id.*

179. *Id.* at 415–16.

180. *Id.*; see also KIELY, *supra* note 81, at 224.

181. SAFERSTEIN, *supra* note 59, at 416.

182. *Id.*

183. *Id.*

AFIS, unlike DNA testing, cannot produce a statistical estimate of a particular fingerprint within the general population.¹⁸⁴ There is only an assumed, statistically unproven theory that all fingerprints are unique.¹⁸⁵ Nevertheless, the Illinois legislature considers fingerprint testing to be reliable enough to include in § 5/116-3.¹⁸⁶

4. *Ballistics Testing's Minor Setbacks Should Not Deter Legislators from Adding It to § 5/116-3*

It is true that IBIS, like AFIS, cannot yield results that are perfectly accurate. In fact, there may be occasional situations that adversely affect IBIS's ability to identify a particular weapon, but such situations do not effect ballistics testing's overall reliability. The following sections discuss the five basic critiques of ballistics testing, and why unmatchable bullets should not deter legislators from including ballistics testing in the statute.

a. Alterations to the Barrel

If a barrel suffers corrosion, pits, or rust, or if damage is caused accidentally or by improper cleaning, then some stria may be destroyed within the barrel, lessening the chance of identifying a bullet to that particular firearm.¹⁸⁷ Severe rust will likely be stripped off with each bullet, giving each bullet a slightly different signature.¹⁸⁸

It is true that the individual characteristics within the barrel of a firearm are constantly changing, but "the majority of these individual characteristics will remain with the weapon for its working life."¹⁸⁹ Like fingerprint testing, which only needs to link 6 to 8 out of 150 possible comparison points to legally find a match in the United States,¹⁹⁰ it is still possible to find a match from the majority of remaining unique striation marks in an altered barrel of a firearm.¹⁹¹

b. Improper Use of the Firearm

A novice firearm user may attempt to use an improper bullet with a particular firearm. For example, the bullet may have a smaller diameter than what is required, and therefore the bullet will not be able to

184. KIELY, *supra* note 81, at 224.

185. *Id.*

186. *See* 725 ILL. COMP. STAT. 5/116-3 (2004).

187. HEARD, *supra* note 43, at 125; *see also* DI MAIO, *supra* note 56, at 40.

188. DI MAIO, *supra* note 56, at 40.

189. HEARD, *supra* note 43, at 125.

190. KIELY, *supra* note 81, at 223. Some nations outside of the United States require a link of fourteen comparison points to find a legally recognized fingerprint match. *Id.*

191. HEARD, *supra* note 43, at 125.

grasp onto the rifling pattern and produce sufficient striation marks.¹⁹² If this is the case, then a firearms examiner may not be able to identically replicate the incident, since it is highly unlikely for two bullets to “slip” down the barrel the exact same way.¹⁹³ If a bullet is too large in diameter for the barrel, the bullet will be wedged through the barrel resulting in an elongated bullet with very distinguished lands and grooves.¹⁹⁴ Problems may also arise when the tip of the barrel is sawed off to prevent the firearm from being linked to crimes.¹⁹⁵ If such a firearm is used, however, it may still be possible to locate an area of damage to a land or groove on a bullet which can cause the bullets to be linked with the sawed off firearm at issue.¹⁹⁶

c. Polygonal Rifling

Using only striation marks from polygonal rifling, which can be compared to the use of gloves by a perpetrator, makes it practically impossible to link a bullet to a firearm since the lands are gradual and undefined, making it extremely difficult to locate.¹⁹⁷ Polygonal rifling is created by placing a mandril into the barrel of a firearm and hammering around the exterior of the barrel so that the interior of the barrel takes on the shape of the mandril.¹⁹⁸ Since the same mandril, which remains unaltered, will be used to create hundreds of barrels, these barrels will most likely be virtually identical at first glance.¹⁹⁹ There are other individual characteristics created during the barrel finishing processes, however, which may be used to match a bullet to a particular firearm.²⁰⁰ Specifically, the lead and the crowning may leave enough individual marks on the bullet to match it to a specific firearm.²⁰¹

192. DI MAIO, *supra* note 56, at 40.

193. *Id.*

194. *Id.* at 42.

195. HEARD, *supra* note 43, at 125.

196. *Id.* at 125–26. A bank robber sawed off part of the barrel of his firearm in between several robberies. *Id.* By the final robbery, all of the rifling had been sawed off. *Id.* The police were able to match the bullets from the first and second robberies; however, matching the bullets from the later robberies was difficult since the lands were drastically altered. *Id.* Nevertheless, the police were able to match all of the bullets because damage was caused to one of the barrel's grooves (most likely from a steel cleaning rod). *Id.*

197. HEARD, *supra* note 43, at 117, 131. Polygonal rifling is seen predominately in shotguns. *Id.*

198. *Id.* at 131.

199. *Id.*

200. *Id.*

201. *Id.* The lead is located in front of the chamber where the rifling is cut back to some extent and the crowning is located in the muzzle at the end of the barrel. HEARD, *supra* note 43, at 131.

d. Damage upon Impact

Some bullets may not be comparable due to the damaging effects of external factors.²⁰² The damaged bullet, similar to an incomplete fingerprint left on a surface,²⁰³ may be either too mutilated or fragmented to link with a known firearm.²⁰⁴ Semiquantitative or quantitative compositional analysis may be used, however, to match the damaged bullet to other bullets fired from a specific firearm or from the crime scene.²⁰⁵

Prior to any and all inspections, the examiner should ensure that the evidence gathered at the crime scene is free of foreign material, such as blood, tissue, soil, asphalt, or building materials.²⁰⁶ Even though it is not easy to remove such material by conventional means, the use of ultrasonic cavitation, effective in removing crystalline materials, is not recommended.²⁰⁷ Any means "other than ultrasound cleaners should be utilized to clean bullets [and casings found at the crime scene] prior to examination and IBIS entry."²⁰⁸

Once the bullet or cartridge casing from the crime scene is thoroughly cleaned, the examiner will inspect the available Land Engraved Area (LEA) and enter the available LEA into IBIS.²⁰⁹ IBIS then yields a possible correlation score between each pair of LEAs.²¹⁰ The LEA scores are ultimately totaled within each phase to create a phase score.²¹¹

202. DI MAIO, *supra* note 56, at 41.

203. KIELY, *supra* note 81, at 223 (stating that only "[s]mooth, nonporous surfaces such as glass, painted or varnished surfaces, plastic molded surfaces, paper, cardboard, polyethylene-based products, vinyl, rubber, leathers, some metal surfaces, untreated wood products, waxed surfaces, and human skin" can hold a print).

204. *See* DI MAIO, *supra* note 56, at 41.

205. *Id.* ("Scanning electron microscopy with energy dispersive x-ray (SEM-EDX) is suitable for semi-quantitative and inductively coupled plasma atomic emission spectroscopy for quantitative compositional analysis.").

206. Mitch Rector, *Effects of Ultrasonic Cleaning of Bullets on IBIS Correlation Scores: A Preliminary Report*, 34 AFTE J. 165, 165 (2002).

207. *Id.* ("[The ultrasonic bath is] an electric source to propagate high frequency sound waves through a liquid medium causing cavitation bubbles to form. Cavitation is the formation of vapor bubbles in a liquid due to a localized reduction in pressure.").

208. *Id.* at 167.

209. Pavel Giverts et al., *An Average Phase Scoring for Bullets, in the IBIS Correlation Results*, 34 AFTE J. 199, 199 (2002).

210. *Id.* If a LEA image is missing, IBIS indicates the LEA as "No ROI" (No Region of Interest) thereby making the LEA score zero. *Id.*

211. *Id.* It has been suggested that the Phase Score should be calculated as an average of LEA scores within a certain phase as opposed to a summation of LEA scores. *Id.* at 200. Examiners may also predict with great accuracy the approximate number of lands and grooves from damaged bullets. *Rifling*, *supra* note 59. For example, if there is only one land and groove impression visible (the minimum requirement), measure the land impression width and the

Additionally, the decomposition of the victim's body may also cause degradation of bullet's striations, like an unpreserved fingerprint.²¹² This, however, depends upon the material of the bullet.²¹³ The most affected bullets are those with copper alloy jacketing.²¹⁴

e. IBIS Is Continuously Growing

The IBIS, CODIS, and AFIS databases are large and still growing. Nationwide, there are currently more than 800,000 images on IBIS.²¹⁵ Though this is a considerable amount of collected images, the more images IBIS has, as with CODIS and AFIS, the more efficient and reliable it will become.²¹⁶ Like AFIS, which stores the fingerprints of convicted criminals, government employees, and those applying for federal jobs,²¹⁷ IBIS is limited because most states, with the exception of New York and Maryland, only "fingerprint" old handguns used in prior crimes.²¹⁸

One possible method of assisting IBIS's growth would be to scan all new firearms prior to sale.²¹⁹ Critics worry that firearms examiners would be overwhelmed by an implementation of IBIS for all new firearm sales.²²⁰ They fear that test firing each firearm and then scanning the spent bullets and cartridge casings would be extremely laborious.²²¹ To do so, firearms examiners must "use state-of-the-art equipment . . . which carries the promise of forward compatibility with

groove impression width. *Id.* Assume the land impression width is 0.045 inches and the groove impression width is 0.243 inches. *Id.* Then the diameter of the bullet's suspected or measured caliber (e.g., .357) is divided by the sum of one total land and groove impression (0.288) and is then multiplied by pi (3.14) to yield 3.89. *Id.* Therefore, the approximate number of lands/grooves of the firearm that fired the damaged bullet would be 4. *Id.*

212. DI MAIO, *supra* note 56, at 42.

213. *Id.*

214. *Id.* An experiment in which different bullets were inserted into different areas of a decedent's body for sixty-six days yielded the following results:

1. Nylon-clad bullets were uniformly unaffected by decomposition.
2. Aluminum jacketed bullets were mildly affected but there was no loss of striations.
3. Lead bullets from the brain, chest cavity, and abdominal cavity showed mild tarnishing but were matchable while those from fat and muscle showed dissolution and oxidation to the point of impairing a match.
4. Bullets with copper alloy jacketing, including those with nickel-wash, were not matchable except for copper alloy bullets recovered from the chest cavity which were borderline.

Id.

215. SAFERSTEIN, *supra* note 59, at 441.

216. De Kinder, *supra* note 104, at 198-99.

217. KIELY, *supra* note 81, at 219.

218. Braga & Pierce, *supra* note 56, at 701.

219. *Id.* at 701-02.

220. *Id.* at 702; De Kinder, *supra* note 104, at 199.

221. De Kinder, *supra* note 104, at 199.

future technology."²²² That said, IBIS may be just that type of equipment.

IV. IMPACT: PROPOSED AMENDMENT TO LEGISLATION

Now is the time for the Illinois legislature to amend § 5/116-3 to include ballistics testing because it is reliable and generally accepted within the scientific community worldwide. Ballistics testing has been allowed in Illinois courts since 1930,²²³ and meets the *Frye* standard. This Part examines specifically how DNA testing pursuant to postconviction motions has greatly improved the criminal justice system, and the effect of ballistics testing if allowed under § 5/116-3.²²⁴

A. The Allowance of DNA Testing Under § 5/116-3 Has Greatly Improved the Criminal Justice System

Even though DNA testing has only recently been accepted within the courts, it has already been a tremendous benefit to the legal system by helping to ensure that the innocent remain free and the guilty serve their sentences. The trial courts were the first to begin accepting DNA testing;²²⁵ an appellate court first held DNA evidence admissible in 1988.²²⁶ Subsequently, courts were quick to use the well-established and reliable DNA testing methods to convict or exonerate defendants.²²⁷ In early 1992, only four years after the seminal appellate court decision allowing DNA evidence in the courtroom, forty-three states had held DNA evidence admissible.²²⁸

DNA testing pursuant to postconviction motions has also been accepted in thirty-seven state statutes and has proven to be quite successful in its implementation.²²⁹ In 1999, DNA testing performed pursuant to a postconviction motion was used to exonerate a defendant who had already served eighteen years in prison for a rape

222. *Id.*

223. *People v. Fisher*, 172 N.E. 743, 754 (Ill. 1930).

224. *See infra* notes 225–239 and accompanying text.

225. PAUL C. GIANNELLI & EDWARD J. IMWINKELRIED, 2 *SCIENTIFIC EVIDENCE* § 18-5 (2d ed. 1993).

226. KIELY, *supra* note 81, at 270; *see also* *Andrews v. State*, 533 So. 2d 841, 850–51 (Fla. Dist. Ct. App. 1988).

227. KIELY, *supra* note 81, at 270.

228. GIANNELLI & IMWINKELRIED, *supra* note 225, § 18-5 (quoting John Hicks, the head of the FBI crime laboratory at that time).

229. KIELY, *supra* note 81, at 272.

charge.²³⁰ This was reportedly the sixty-sixth exoneration in the United States due to DNA testing.²³¹

On July 23, 1997, Illinois enacted § 5/116-3 to allow DNA and fingerprint testing under specific circumstances.²³² Within only four months, twelve wrongfully convicted defendants were exonerated as a result.²³³ It is clear that DNA testing has ensured that fewer miscarriages of justice occur.

*B. What Will Be the Effect if Ballistics Testing
Is Allowed Under the Statute?*

Similar to the effect of allowing for DNA testing by postconviction motion, permitting ballistics testing under § 5/116-3 would give the citizens of Illinois a chance to ease any lingering doubts they might have about a person's guilt. It would also allow those convicted an opportunity to prove actual innocence, should they meet all of the statute's requirements.

Critics are afraid that allowing ballistics testing under the statute will open up a "Pandora's box" by tolerating uncertainty or delay.²³⁴ But these fears should be eased by the future benefits of the proposed amendment: "[T]he quintessential miscarriage of justice is the execution of an innocent person."²³⁵ The Supreme Court has found that "the threat to judicial resources, finality, and comity posed by actual innocence claims is significantly less than that posed by sentencing claims."²³⁶ The limitations provided by the statute as currently written ensure that not every case will be reopened.²³⁷

Ballistics testing, like DNA and fingerprint testing, would have benefits in postmortem cases.²³⁸ Even if the defendant has already died of natural causes or has been executed, and therefore could not possibly go free, ballistics testing could ease any lingering doubts of citizens or family regarding guilt.²³⁹

230. *Id.*

231. *Id.* at 272-73 (citing Robert P. Sigman, *Genetic Tests Highlight Errors in Justice*, KAN. CITY STAR, Dec. 28, 1999, at B6).

232. O'Reilly, *supra* note 3, at 114.

233. *Id.*

234. *Id.* at 117.

235. *Schlup v. Delo*, 513 U.S. 298, 299 (1995).

236. *Id.*

237. *Kuhlmann v. Wilson*, 477 U.S. 436, 452 (1986).

238. O'Reilly, *supra* note 3, at 117.

239. *Id.*

V. CONCLUSION

The Illinois legislature should reflect upon the true purpose of § 5/116-3, which is to “provide an avenue for convicted defendants who maintained their innocence to test available . . . material capable of producing new and dramatic evidence materially relevant to the question of innocence.”²⁴⁰ This Comment asserts that IBIS is well established in the scientific community, is reliable, and is used as an investigative tool to help solve cases. It has discussed cases and studies in which IBIS was used and it has compared IBIS, CODIS, and AFIS. Like DNA and fingerprint testing—which were once outcasts in the legal community, but have now saved numerous lives—ballistics testing, too, will yield the same results if permitted pursuant to post-conviction motions. Although many states’ statutes do not specifically allow ballistics testing under postconviction motions, their broad language arguably encompasses it. The Illinois legislature needs to take the steps necessary to overcome its apprehension about being the first state to formally embrace ballistics testing in postconviction motions.²⁴¹

In failing to amend § 5/116-3 to include ballistics testing, the Illinois legislature is essentially condoning miscarriages in its criminal justice system by neglecting to utilize a reliable, recognized, and readily available science that could prevent the conviction or execution of an innocent person. Moreover, a defendant’s postconviction petition for a ballistics test may be the only possible route in proving his or her innocence. Justice must be served, and technology today allows the courts to do just that. But the courts can only go so far—they must operate within the confines of the statutes created by the legislature.²⁴² The time has come to amend § 5/116-3.

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240. *People v. Urioste*, 736 N.E.2d 706, 710 (Ill. App. Ct. 2000).

241. See *supra* notes 124–222 and accompanying text.

242. *Kinsley v. Kinsley*, 57 N.E.2d 449, 450 (Ill. 1944) (finding that the circuit court cannot usurp legislative enactment).

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